

REMARKS

Claims 1-19 are in the case. Claims 1-3, 5-10, 12-16 and 18-19 were rejected under 35 USC § 103(a) over U.S. Patent No. 5,861,902 to Beerling (hereinafter, "Beerling") in view of U.S. Patent Application Publication No. 2002/0113846 to Wang et al. (hereinafter, "Wang"). Claims 4, 11, and 17 were objected to as being dependent upon a rejected base claim. The Applicants sincerely appreciate the examiner noting that claims 4, 11, and 17 would be allowable if rewritten in independent form including the limitations of the base claim and any intervening claims. The Applicants respectfully traverse the Examiner's rejections under 35 USC § 103(a). Reconsideration and allowance of the claims are requested.

A. CLAIMS 1-3, 5-10, 12-16 AND 18-19 ARE PATENTABLY DISTINGUISHED OVER THE CITED REFERENCES.

As previously described, claims 1-3, 5-10, 12-16 and 18-19 are directed to substrates for micro-fluid ejection devices having characteristics that provide improved formation of **fluid flow paths through the substrates**. A deep reactive ion etching process is used to form the fluid flow paths through the substrate due to the thickness of the substrate and the length of the path through the substrate. By providing an etching location in the substrate that has less than 5000 Angstroms thickness of an **already present** dielectric layer **or** a root mean square depth of surface pitting of less than about 500 Angstroms, improved fluid flow paths may be formed by the deep reactive ion etching process and cycle times for forming the flow paths may be significantly reduced. Thus applicants have recognized a problem with conventional deep reactive ion etching processes and have provided a novel solution to the problem.

The MPEP outlines three conditions that must be met for a *prima facie* case of obviousness to be made out. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the combined references must provide **all** the claim limitations. The asserted arguments against the claimed invention have failed to find one or more of these criteria.

With regard to the cited references, Beerling fails to suggest, disclose, or teach forming fluid paths through a substrate. Beerling also fails to teach, suggest or disclose etching a **substrate** using dry etching or deep reactive ion etching. Dry etching is only use in Beerling to form holes in a silicon nitride dielectric layer 92 and not to form fluid paths in the substrate 12. In contrast to deep reactive ion etching, Beerling teaches etching the substrate using an electrochemical process using hydrofluoric acid (a wet chemical etching process). See, Beerling, Column 11, line 63 to column 12, line 1. The electrochemical etch is used to form pores in the substrate. The porous area of the substrate in Beerling provides a thermal barrier island, not a fluid flow path through the substrate.

Moreover, the dielectric layer in Beerling having a thickness between 1000 to 3000 angstroms is not added to the substrate until **after** the etching step to form the thermal barrier island is completed. See, Beerling, Column 9, line 23. Accordingly, Beerling fails to recognize the problem associated with dry etching a substrate or provide any proposed solution to the problem. The motivation for minimizing the thickness of the dielectric layer in Beerling is to “minimize the thermal mass” of the dielectric layer because using a thin dielectric layer “improves the heat flow around the thermal barrier island 16’ to the substrate 12’ which acts as a thermal sink” Beerling, Column 9, lines 10-17. Hence, the motivation for making dielectric layer 24’ with 1000 to 3000 angstroms has nothing to do with maximizing the efficiency of etch time through the dielectric layer and substrate using a deep reactive ion etching process.

The Wang reference is cited merely for teachings relating to etching a substrate using a deep reactive ion etching process. However, like Beerling, the Wang reference fails to recognize the problem associated with deep reactive ion etching process cycle times and fails to propose a solution to the problem. There is nothing in the Wang reference that suggests there is any advantage to providing a passivation layer of no more than 5000 Angstroms as called for in the claims or the advantages of providing such a limited dielectric layer thickness. According to Wang, the passivation layers 18 and 20 can have any thickness ranging from 1000 to 100,000 Angstroms. Clearly, Wang fails to recognize the advantage of dry etch cycle time provided by the limited dielectric thickness provided by the claimed invention. The Wang reference is also silent with

respect to the maximum surface pitting depth of the substrate. Accordingly, even if the Wang reference is combined with Beerling as suggested by the examiner, the combined references fail to provide all the elements of the claimed invention.

With regard to the criterion that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, the reason(s) for such motivation are wholly lacking in the references. The statements in regard to the motivation to combine the various references listed above amount to no more than conclusory statements of generalized advantages and convenient assumptions about what was known by skilled artisans. In the rejections, elements have been selectively extracted from the cited references in an attempt to rearrange those elements in a manner to provide the claimed invention. Such combination and rearrangement ignores the fact that the references failed to recognize the problem solved by the present invention.

If the deep reactive ion etching process of Wang is substituted for dry etching process in Beerling in Column 14, lines 10-15 as suggested by the examiner, etching would only be conducted on the dielectric layer 92 rather than the underlying substrate which is said to be etched by a chemical etching process as described above to provide pores in the substrate. It is not explained how the deep reactive ion etching process of Wang could be used in Beerling to undercut silicon nitride layer and remove portions of the silicon dioxide layer 90 or why one would be motivated to select the deep reactive ion etching process for that purpose rather than the chemical etch process. Accordingly, the examiner has failed to find motivation in the references to make the combination. Furthermore, the teachings in Wang have absolutely nothing to do with minimizing heat transfer between a heating element and a heat sink, and thus there is no motivation in Wang to combine Wang with Beerling.

Proper motivation must be found to make the selection and combination of prior art elements in the cited references. Applicants assert that without the proper motivation, the combination of references is improper and thus the combined references do not render the claims obvious. As noted above, the mere fact that various elements *could be* placed in combination is not a sufficient motivation for actually making the

combination. An infinite number of different elements *could be* placed in combination, but in order to make the present combination obvious, there must be explicit motivation in the references to make the combination.

There is nothing in the prior art cited to lead a person of ordinary skill to design an apparatus like that of the present invention, other than the hindsight knowledge of this invention. The office action recites certain generalized benefits (realized in hindsight after considering the invention) as motivation for the combination of the references. **The motivation to combine references cannot come from the invention itself.** See *In re Oetiker*, 24 U.S.P.Q.2D 1443, 1446. The claims of the present application appear to have been used as a frame, and individual parts of separate prior art references were employed to recreate a facsimile of the claimed invention. See *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 220 U.S.P.Q. 303, 312. There is no explanation of what there was in the prior art that would have caused those skilled in the art to combine the references in the way they are combined by the examiner to provide the claimed invention.

The Examiner has the burden to show some teaching or suggestion in the references to support their use in the particular claimed combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 5 U.S.P.Q.2D at 1438-1439. In the apparent absence of such teaching or suggestion, applicants respectfully suggest that the references are improperly combined. Reconsideration and allowance of claims 1, 8 and 14 are believed in order and are respectfully requested.

Dependent claims 2, 3, 5-7, 9, 10, 12, 13, 15, 16, 18, and 19 depend from independent claims 1, 8, and 14, and contain additional important aspects of the invention. Therefore, dependent claims 2, 3, 5-7, 9, 10, 12, 13, 15, 16, 18, and 19 are patentable over Beerling in view of Wang for the same reasons claims 1, 8, and 14 are patentable over Beerling in view of Wang. Reconsideration and allowance of dependent claims 2-3, 5-7, 9-10, 12-13, 15-16, and 18-19 are respectfully requested.

B. THE OBJECTION TO CLAIMS 4, 11 AND 17 HAS BECOME MOOT.

Dependent claims 4, 11, and 17 depend from independent claims 1, 8, and 14, and contain additional important aspects of the invention. Therefore, dependent claims 4, 11, and 17 are patentable over Beerling in view of Wang for the same reasons claims 1, 8,

and 14 are patentable over Beerling in view of Wang. Reconsideration and allowance of dependent claims 4, 11, and 17 are respectfully requested.

CONCLUSION

Applicants assert that the claims of the present application patentably define over the prior art made of record and not relied upon for the same reasons as given above. Applicants respectfully submit that a full and complete response to the office action is provided herein, and that the application is now fully in condition for allowance. Action in accordance therewith is respectfully requested.

In the event this response is not timely filed, applicants hereby petition for the appropriate extension of time and request that the fee for the extension be charged to deposit account 12-2355. If other fees are required by this amendment, such as fees for additional claims, such fees may be charged to deposit account 12-2252.

Respectfully submitted,

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